Claims

1. A multi-mode co-boresighted sensor system mounted on a gimbal assembly of an airborne platform, comprising:

RF sensor means for sensing RF energy;

first optical sensor means for sensing a first type optical energy;

second optical sensor means for sensing a second type optical energy;

primary mirror assembly having a common collecting aperture for the RF energy and the first and second type optical energy;

secondary transmissive/reflective mirror assembly located forward of a focal region of the primary mirror assembly for permitting propagation of RF energy and first type optical energy therethrough to the focal region of the primary mirror assembly and having a reflective surface for reflecting said second type optical energy rearward to said second optical sensor means;

said RF sensor means and said first optical sensor means being located at said focal region on an opposite side of the secondary mirror assembly from said second optical sensor means;

whereby said RF energy and said first type optical energy simultaneously uses the full collecting aperture of the reflecting surface of the primary mirror assembly along with the second type optical energy as well as sharing a common signal path through said secondary mirror assembly to said RF sensor means and said first optical sensor means.

2. A sensor system according to claim 1 wherein said first optical sensor means comprises laser energy sensor means, wherein said second optical sensor means comprises infrared energy sensor means, wherein said RF sensor means comprises millimeter wave RF sensor means.

3. A sensor system according to claim 1 wherein said first type optical energy comprises laser energy, said second type optical energy

comprises infrared (IR) energy and said RF energy comprises millimeter wave (MMW) RF energy.

4. A multi-mode co-boresighted transmitting/receiving sensor system for a seeker, comprising:

an RF sensor assembly for sensing RF energy;

a laser energy sensor assembly for sensing laser energy;

an infrared energy sensor assembly for sensing IR energy;

a primary mirror assembly having a common collecting aperture for the RF energy and the laser and IR energy;

a secondary transmissive/reflective mirror assembly located forward of a focal region of the primary mirror assembly for permitting propagation of RF energy and laser energy therethrough to the focal region of the primary mirror assembly and having a reflective surface for reflecting said IR energy rearward to the infrared energy sensor assembly;

said RF sensor assembly and said laser energy sensor assembly being located at said focal region on an opposite side of the secondary mirror assembly from said infrared energy sensor assembly;

wherein said RF energy and said laser energy simultaneously uses the full collecting aperture of the reflecting surface of the primary mirror assembly along with the IR energy as well as sharing a common signal path through said secondary mirror assembly to said RF sensor assembly and said laser energy sensor assembly.

5. A sensor system according to claim 4 wherein said secondary mirror assembly intersects a central longitudinal axis of the primary mirror assembly.

6. A sensor system according to claim 5 wherein the secondary mirror assembly includes a dielectric member located orthogonal to said central longitudinal axis.

7. A sensor system according to claim 6 wherein said reflective surface of the secondary mirror assembly comprises dielectric means facing said infrared sensor.

8. A sensor system according to claim 7 wherein said dielectric means comprises a dielectric coating in a face of the dielectric member.

9. A sensor system according to claim 7 wherein said infrared energy sensor is located on said central longitudinal axis.

10. A sensor system according to claim 7 and additionally comprising light diffractive means located between the secondary mirror assembly and the laser energy sensor assembly for causing respective optical and RF focal planes in the focal region of the primary mirror assembly to separate so as to focus the laser energy on said first optical sensor assembly while propagating the RF energy unaffected thereby to the RF sensor assembly.

11. A sensor system according to claim 10 wherein said diffractive means comprises a diffractive lens.

12. A sensor system according to claim 10 wherein said laser energy sensor assembly includes at least one laser energy conductor for extracting and diverting the laser energy away from the common signal path of the laser energy and the RF energy to at least one side located laser energy detector element while providing substantially unobstructed propagation of the RF energy to the RF sensor assembly.

13. A sensor system according to claim 12 wherein said at least one laser energy conductor comprises a light pipe member having an angulated reflective surface in the common signal path of the laser energy and the RF energy.

14. A sensor system according to claim 13 wherein said at least one laser energy conductor comprises four mutually orthogonal light pipe members having respective angulated reflective surfaces at an inner end thereof located in the common signal path and wherein said at least one laser energy detector element comprises a set of laser energy detectors located at the outer end of said light pipe members.

15. A sensor system according to claim 14 and additionally including electromagnetic energy interference shielding elements located between each of said light pipe members and said laser energy detectors.

16. A sensor system according to claim 10 wherein said RF sensor assembly includes means for feeding RF energy in the focal region away from the focal region to an external RF detector.

17. A sensor system according to claim 16 wherein means for feeding RF energy comprises an RF waveguide member having an opening at the RF focal plane.

18. A sensor system according to claim 17 wherein said RF waveguide member comprises a bifurcated waveguide member having a central opening at the RF focal plane.

19. A sensor system according to claim 7 wherein the RF sensor assembly and the laser energy sensor assembly include energy collection means and RF energy feed means commonly located in the focal region of the primary mirror assembly and having a shared image plane.

20. A sensor system according to claim 19 wherein said laser energy collection means and said RF energy feed means are commonly located in a section of a waveguide member for feeding RF energy to an external RF detector and having an opening at said focal region.

21. A sensor system according to claim 20 wherein said section comprises a central waveguide section of a bifurcated waveguide member and wherein said section includes an opening at said focal region.

22. A sensor system according to claim 21 wherein said laser energy collection means includes laser energy reflection means located internally of the central waveguide section adjacent said opening for reflecting laser received from the primary mirror assembly out of at least one opening in a side surface of said waveguide section.

23. A sensor system according to claim 22 and additionally including laser energy detector means located adjacent said at least one opening exteriorally of said waveguide section for detecting laser energy reflected from said reflecting means.

24. A sensor system according to claim 23 wherein said laser energy reflecting means comprises a plurality of beam splitting prisms each having a reflecting surface angulated at 45° for reflecting laser energy at 90° to respective side openings in said waveguide section.

25. A sensor system according to claim 24 wherein said plurality of prisms comprises a set of four beam splitting prisms located side by side in said waveguide section and said laser energy detector means comprises a set of laser energy detectors located exteriorally of said waveguide section.

26. A sensor system according to claim 25 wherein said set of laser energy detectors are selectively attached to one or more side surfaces of said waveguide sections.

27. A sensor system according to claim 25 and additionally including a set of electromagnetic energy interference shielding elements

located between said set of laser energy reflecting prisms and said set of laser energy detectors.